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An unending variety of topics

Thursday, February 11, 2010

Interstellar archaeology and surface engineering

The SETI League has published a short article describing my strategy for what some have dubbed "interstellar archaeology", namely the use of astronomical instruments to look for alien artifacts in other star systems or galaxies. In contrast to SETI, which listens for radio or optical transmissions, interstellar archaeology is looking for material structures. The connection between surface engineering and strategies that look for alien constructions seems quite obvious to me, now that I have thought of it, but I've done a literature and Internet search and haven't seen the connection made by others. The discussions seem to be all about the design of these hypothetical astrostructures themselves rather than about what astronomical instruments could give us a great deal of information about, if there are any to be seen, namely their surfaces.

My strategy emphasizes that, whatever the alien structure may be, we would be looking at its surface. Artificial surfaces tend to be highly engineered for useful thermal and optical properties. The spectra of artificial satellites, painted surfaces, skyscraper windows, and so on exhibit many features which are extremely improbable in nature. For example, skyscraper windows and spacecraft surfaces often have gold at concentrations millions of times higher than stellar dust clouds, because of gold's very good thermal and optical functions. There are also many artificial molecules used in paints, again with unique spectra that would stand out from natural galactic features. Advanced ETI may have moved on to more advanced surfaces, but whatever they use, it is very likely to have highly unnatural spectra in order to optimize its function.

My surface-engineering-based search strategy has the added benefit that it doesn't matter how large any individual structure is, so long as a collection of artifacts collectively present surfaces that look artificial enough to stand out from natural galactic spectra. It also doesn't matter whether or not ETI are operating any of a number of hypothesized high-energy nuclear technologies: natural sunlight reflected off artificial surfaces is sufficient. Thus "Fermi bubbles", hypothetical regions of other galaxies to which an ETI civilization has spread, may be most readily recognized not by features recognizable to the human eye (in any nearby large galaxy, astronomers would already have discovered them), nor by determining what kinds of structures the ETI have constructed, but analyzing, often by exhaustive computer search, spectra of different regions in galaxies for the tell-tale signatures of engineered surfaces.

Posted by Nick Szabo at 12:11 AM

Pages

- Home

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Nick Szabo

"A premier thinker about history, law and economics, and the lessons they have for security." -- Adam Shostack, Emergent Chaos

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6 comments:

nazgulnarsil said...

it seems that energy efficient engineering would dampen our efforts. dyson spheres for instance would be hard to spot since they wouldn't be radiating much energy into space.

8:39 AM

nick said...

Energy is conserved, so they have to radiate any energy they are using, just at lower frequencies such as infrared. Since there is no such thing as a perfect black body, differences between different "gray body" radiators (e.g. between natural carbon-rich dust clouds and artificial radiators) will show up on the infrared spectra.

12:36 PM

alexi de sadesky said...

Wow. That is absolutely fantastic. It seems like every time I come here you provide me with some sort of "aHA!" moment. Thanks for sharing your thoughts, I hope you continue to do so for a long while.

4:46 PM

Anonymous said...

There's probably enough existing spectral data that there's no new observations needed - just data mining on the current exabytes of data. Easily distributable computation problem too.

3:53 PM

Graham said...

To echo Alexi's comment - well done, and keep posting these thought-provoking articles. Perhaps we silent admirers haven't been giving you enough praise! Everything you write stretches my brain and leads me into new areas.

2:17 PM

Anonymous said...

nice post. thanks.

11:10 AM

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- ► 2018 (1)
- ► 2017 (3)
- ► 2016 (4)
- ► 2015 (3)
- ► 2014 (3)
- ► 2013 (3)
- ► 2012 (8)
- ► 2011 (12)
- ▼ 2010 (9)
  - ► December (1)
  - ► October (4)
  - ► September (2)
  - ▼ February (2)
    - Interstellar archaeology and surface engineering
    - The basics: procedural vs. substantive law
- ► 2009 (29)
- ► 2008 (55)
- ► 2007 (47)
- ► 2006 (130)
- ► 2005 (44)

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